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CLAIMS

1. Fuel composition for two-stroke engines, comprising:
combustible hydrocarbonaceous liquid fuel;
5 lubricant comprising an oil of lubricating viscosity;
a detergent comprising an alkaline earth metal-containing compound; and a
molybdenum source.
2. The fuel composition of claim 1, wherein the alkaline earth metal-containing
10 compound comprises a salt selected from the group consisting of calcium sulphate,
calcium phenate, magnesium sulphate, and magnesium phenate, or combinations and
mixtures thereof.
3. The fuel composition of claim 1 or claim 2, wherein the detergent
15 comprises a detergent selected from the group consisting of neutral calcium sulphate
detergents and neutral calcium phenate detergents, or combinations and mixtures thereof.
4. The fuel composition of any one of claims 1 to 3, wherein the molybdenum
source is selected from the group consisting of molybdenum trioxide, molybdenum
20 sulfates, molybdenum phenates, molybdenum salicylates, molybdenum carboxylates,
mono-nuclear and di-nuclear and tri-nuclear molybdenum dithiocarbamates, neutral and
overbased molybdenum salicylates, overbased molybdenum phenates, overbased
molybdenum sulfates, ammonium molybdate, sodium molybdate and potassium
molybdate, and molybdenum halides, compounds derived from molybdenum reacted with
25 amines and alcohols, and combinations and mixtures thereof.
5. The fuel composition of any one of claims 1 to 4, wherein the molybdenum
source comprises an organomolybdenum complex prepared by reacting fatty oil,

diethanolamine, and a molybdenum source.

6. The fuel composition of any one of claims 1 to 5, wherein the liquid fuel is selected from the group consisting of diesel fuel, biodiesel fuel, biodiesel-derived fuel,
5 synthetic diesel, jet fuel, alcohols, ethers, kerosene, Fischer-Tropsch fuels, liquid petroleum gas, fuels derived from coal, genetically engineered biofuels and crops and extracts therefrom, unleaded motor gasolines, reformulated gasolines which contain both hydrocarbons of the gasoline boiling range and fuel-soluble oxygenated blending agents, gasoline, bunker fuel, and mixtures thereof, and emulsions, suspensions, and dispersions
10 thereof in water, alcohol, and other carrier fluids.

7. The fuel composition of any one of claims 1 to 6, comprising about 95 to about 99 wt.% combustible hydrocarbonaceous liquid fuel, about 1 to about 5 wt.% lubricant comprising an oil of lubricating viscosity, about 0.001 to about 0.05 wt.% alkaline
15 earth metal-containing compound, and about 1 ppm to about 10 ppm Mo from the molybdenum source.

8. A method for controlling the deleterious effect on exhaust emissions after-treatment and control devices of at least one metal contaminant and compounds thereof in
20 an exhaust stream from the combustion of a combustible fuel composition in a combustion system of a two-stroke engine, said method comprising the steps of:

(a) intaking a fuel composition into a combustion system of a two-stroke engine, wherein the fuel composition comprises

- 25 i) combustible hydrocarbonaceous liquid fuel,
- ii) lubricant comprising an oil of lubricating viscosity,
- iii) a detergent comprising an alkaline earth metal-containing compound, and
- iv) a molybdenum source;

(b) combusting in the combustion system the hydrocarbonaceous fuel to produce combustion products comprising at least one material selected from the group consisting of alkaline earth metal and compounds thereof;

(c) contacting the molybdenum with at least one of the alkaline earth metal,
5 and compounds thereof, in the combustion products,

(d) flowing the combustion products over at least one of a catalyst, a sensor, and an on-board diagnostic device, or a combination of these;

wherein the molybdenum interacts with at least one of the alkaline earth metal or compounds thereof effective to increase detergency, as compared to conducting the same
10 method without including the molybdenum source in the fuel composition, and without blocking the catalyst, sensor and/or on-board diagnostic device.

9. The method of claim 8, wherein the fuel composition is a composition according to any one of claims 2 to 7.
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10. The method of claim 8 or claim 9 wherein the alkaline earth metal comprises calcium, and the alkaline earth metal compound in reduced level is calcium sulphate.

20 11. The method of any one of claims 8 to 10, wherein the alkaline earth metal and compounds thereof in the combustion products originate from the detergent contained in the fuel composition.

12. The method of any one of claims 8 to 11, wherein the combustion system
25 further comprises flowing the combustion products through an after-treatment system.

13. The method of claim 12, wherein the combustion system further comprises flowing the combustion products through an after-treatment system, wherein the after-

treatment system is selected from the group consisting of a catalyzed diesel particulate filter and a continuously regenerating technology diesel particulate filter.

14. An apparatus for performing the method of any one of claims 8 to 13, said
5 apparatus comprising:

- (a) a two-stroke engine including a combustion chamber adapted to combust a fuel composition;
- (b) a means to introduce the fuel composition into the combustion chamber;
- (c) means to initiate combustion of the fuel composition in the combustion
10 chamber;
- (d) a means to convey combustion products from the combustion chamber;
- (e) means to reduce the amount of at least one pollutant from the combustion product.

15 15. The apparatus of claim 14 comprising storage means containing a fuel composition according to any one of claims 1 to 7.

16. The apparatus of claim 14 or claim 15, wherein the means (e) comprises an after treatment system selected from the group consisting of a diesel oxidation catalyst, a
20 catalyzed diesel particulate matter filter, and a continuously regenerating technology diesel particulate filter.

17. The apparatus of any one of claims 14 to 16, wherein the apparatus is selected from the group consisting of a motorcycle, a moped, a snow mobile, an all terrain
25 vehicle, tractor, mining equipment, construction equipment, a marine outboard motor, a lawn mower, a chain saw, a pump, an electrical generator, a garden tiller, a landscaping hedge trimmer, and a back pack blower.

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18. The apparatus of any one of claims 14 to 17, wherein the apparatus is selected from the group consisting of a gasoline engine and a diesel engine.

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19. A method for improving the durability of an after-treatment device for a
5 two-stroke engine combustion system, said method comprising contacting a fuel
composition containing hydrocarbonaceous fuel, oil of lubricating viscosity, alkaline earth
metal-containing detergent compound, and a molybdenum source, and its combustion
products a combustion system, with the molybdenum source in an amount sufficient for the
molybdenum to interact with one or more contaminants comprising an alkaline earth metal
10 or alkaline earth metal compounds thereof in said fuel composition and combustion
products thereof effective to thereby increase detergency without increasing the amount of
alkaline earth metal compound contaminants contacting the after-treatment device.

20. The method according to claim 19 wherein the fuel composition is a
15 composition according to any one of claims 2 to 7.

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